

Summary

The following information is intended to be a practical guide that helps explain the purpose and philosophy of mCLASS®:Math for Indiana educators. Read to learn more about what is measured, and why, and gain advice and information about interpreting and using the results of mCLASS:Math in your classroom.

Included are:

- Brief thumbnails for each measure in the Screening,
- Alignment to Indiana indicators, both in-grade and upwards
- Suggestions for using the Progress Monitoring and Diagnostic Interview pieces

Measure Thumbnails

Each thumbnail includes a brief description, research rationale, and alignment to specific Indiana indicators.

mCLASS:Math is not designed to perfectly align with the Indiana Academic Standards, but to be a diagnostic tool for teachers. Students' mathematical understanding is plotted on a trajectory within mCLASS:Math, and it is this trajectory that guides the performance levels (red, yellow, green). The information gained from mCLASS:Math can assist teachers in providing appropriate instruction for students in mathematics.

Kindergarten

Oral Counting

Items: Student counts as high as he/she can, starting from 1.

Thresholds	Deficit	Emerging	Established
Beginning	19 or less	20 to 59	60 or more
Middle	29 or less	30 to 69	70 or more
End	42 or less	43 to 82	83 or more

IN Standards: Standard 1 - Number Sense.

IN Indicators: Count, recognize, represent, name, and order a number of objects up to 10 (K.1.6).

Upward Indicators: First graders are expected to count, read, and write whole numbers up to 100 (1.1.1).

Rationale: Learning the counting sequence and the patterns that govern it are the foundation for understanding the number system and later for developing addition and subtraction strategies. Counting underlies much of what kindergartners are expected to do, and fluent oral counting up through the decades has proven to be a reliable and valid indicator of students who may be at risk of later mathematics difficulty.

Number Identification

Items: Student identifies printed numbers from a set of randomly-assigned digits ranging from 0 to 100. 50% of the numbers are between 0 and 20; 30%, between 21 and 50; and 20%, between 51 and 100.

Thresholds	Deficit	Emerging	Established
Beginning	2 or less	3 to 19	20 or more
Middle	8 or less	9 to 24	25 or more
End	13 or less	14 to 30	31 or more

IN Standards: Standard 1 - Number Sense.

IN Indicators: Count, recognize, represent, name, and order a number of objects up to 10 (K.1.6).

Upward Indicators: First graders are expected to count, read, and write whole numbers up to 100 (1.1.1).

Rationale: Students become familiar with the printed symbols of numbers and begin to develop an understanding of place value (for example, “26” means something different than a “2” and a “6”).

Missing Number

Items: Two numbers and a blank are presented in a forward counting sequence by 1’s, with the location of the blank varying. Student identifies which number is missing from the sequence. Numbers range from 0-20. Examples: [__, 3, 4], [9, __, 11]

Thresholds	Deficit	Emerging	Established
Beginning	0	1 to 6	7 or more
Middle	2 or less	3 to 9	10 or more
End	3 or less	4 to 12	13 or more

IN Standards: Standard 3 - Algebra and Functions.

IN Indicators: Identify, copy, and make simple patterns with numbers and shapes (K.3.2); find the number that is one more than or one less than any whole number up to 10 (K.1.7).

Upward Indicators: First graders are expected to create and extend number patterns using addition (1.3.4).

Rationale: Missing Number taps into mathematical “street smarts”, or number sense. Students may use a variety of strategies to fill in the missing number, including counting up, counting backwards, or quickly recognizing the pattern. Students who are less fluent on this measure may be using more manual strategies (for example, counting up “30, 31, 32, 33, 34...35...”). This task requires students to recognize

the number symbols and their sequence. In later years, quick — or skip — counting, will prove useful in doing repeated addition and subtraction.

Quantity Discrimination

Items: Student points to or says which number in a pair is larger. Of the randomly arranged number pairs, 67% are between 0 and 10 and 33%, between 0 and 20. The order of the numbers is alternated, in terms of placing the larger number first or second between sets. Examples: [7 2]; [13 18]

Thresholds	Deficit	Emerging	Established
Beginning	4 or less	5 to 19	20 or more
Middle	6 or less	7 to 22	23 or more
End	8 or less	9 to 24	25 or more

IN Standards: Standard 1 - Number Sense.

IN Indicators: Know that larger numbers describe sets with more objects in them than sets described by smaller numbers (K.1.3).

Rationale: Number sense involves basic “intuitions” and ideas about numbers, including concepts that make computation easier or eliminate the need for it altogether. It can refer to a child’s fluidity and flexibility with numbers, the sense of what numbers mean, and an ability to perform mental mathematics and to look at the world and make comparisons. Students with good number sense can move seamlessly between the real world of quantities and the mathematical world of numbers and numerical operations. In this task, students begin to connect the written symbols with the quantities they represent.

First Grade

Oral Counting

Items: Student counts as high as he/she can, starting from 1.

Thresholds	Deficit	Emerging	Established
Beginning	42 or less	43 to 82	83 or more
Middle	49 or less	50 to 99	100 or more
End	62 or less	63 to 117	118 or more

IN Standards: Standard 1 - Number Sense.

IN Indicators: Count, read, and write whole numbers up to 100 (1.1.1).

Upward Indicators: Second graders are expected to count by ones, twos, fives, and tens to 100 (2.1.1).

Rationale: Learning the counting sequence and the patterns that govern it are the foundation for understanding the number system and later for developing addition and subtraction strategies. Counting underlies much of what first graders are expected to do, and fluent oral counting up through the decades has proven to be a reliable and valid indicator of students who may be at risk of later mathematics difficulty.

Next Number

Items: Student says the number that follows the number verbally presented by the teacher, ranging from 0 to 100. Teacher –presents the numbers in random order, with 50% of the numbers between 0 and 20; 30%, between 21 and 50; and 20%, between 51 and 100. Example: “What comes after 34?”

Thresholds	Deficit	Emerging	Established
Beginning	8 or less	9 to 16	17 or more
Middle	9 or less	10 to 19	20 or more
End	10 or less	11 to 22	23 or more

IN Standards: Standard 1 - Number Sense.

IN Indicators: Name the number that is one more or one less than any number up to 100 (1.1.4).

Upward Indicators: Second graders are expected to name the number that is ten more or ten less than any number 10 through 90 (2.1.4).

Rationale: Number sense involves basic “intuitions” and ideas about numbers, including concepts that make computation easier or eliminate the need for it altogether. It can refer to a child’s fluidity and flexibility with numbers, the sense of what numbers mean, and an ability to perform mental mathematics

and to look at the world and make comparisons. Students with good number sense can move seamlessly between the real world of quantities and the mathematical world of numbers and numerical operations.

Students who are fluent in this measure have likely developed a solid mental number line on which they can count up and down. They have a familiarity with the counting sequence and are starting to understand the fundamental algorithm of $n+1$. Other students may have to return to a known reference point in the counting sequence in order to give an answer (for example, “What comes after 33?” — “30...31...32...33...34...”).

Number Identification

Items: Student identifies printed numbers from a set of randomly-assigned digits ranging from 0 to 100. Of the digits, 50% are between 0 and 20; 30%, between 21 and 50, and 20%, between 51 and 100. Examples: 2, 6, 18.

Thresholds	Deficit	Emerging	Established
Beginning	13 or less	14 to 43	44 or more
Middle	18 or less	19 to 53	54 or more
End	23 or less	24 to 64	65 or more

IN Standards: Standard 1 - Number Sense.

IN Indicators: Count, read, and write whole numbers up to 100 (1.1.1).

Upward Indicators: Second graders are expected to identify odd and even numbers up to 100 (2.1.7), and identify numbers up to 100 in various combinations of tens and ones (2.1.3).

Rationale: Students become familiar with the printed symbols of numbers and begin to develop an understanding of place value (for example, “26” means something different than a “2” and a “6”).

Missing Number

Items: Two numbers and a blank are presented in a forward counting sequence by 1’s, with the location of the blank varying. Student identifies which number is missing from the sequence, with numbers ranging from 0-20. Examples: [__, 3, 4], [9, __, 11]

Thresholds	Deficit	Emerging	Established
Beginning	4 or less	5 to 19	20 or more
Middle	5 or less	6 to 20	21 or more
End	7 or less	8 to 22	23 or more

IN Standards: Standard 1 - Number Sense, Standard 3 - Algebra and Functions.

IN Indicators: Create and extend number patterns using addition (1.3.4); name the number that is one more than or one less than any number up to 100 (1.1.4).

Upward Indicators: Second graders are expected to identify the pattern of numbers in each group of ten, from 10 through 90 (2.1.2, name the number that is ten more or ten less than any number 10 through 90 (23.4 and create, describe, and extend number patterns using addition and subtraction.

Rationale: Missing Number taps into mathematical “street smarts” or number sense. Students may use a variety of strategies to fill in the missing number, including counting up, counting backwards, or quickly recognizing the pattern. Students who are less fluent on this measure may be struggling to see the pattern (for example, jump by 2s, 3s, 10s), or may make errors in calculating an answer. This task requires students to recognize the number symbols and their sequence. In later years, this quick – or skip – counting will prove useful in doing repeated addition and subtraction.

Quantity Discrimination

Items: Number pairs between 0 and 10 and 0 and 20 are arranged randomly (67% of the number pairs are between 0 and 10; 33%, between 0 and 20). The order of placing the larger number first or second between sets is alternated. Student points to or says which number is larger. Examples: [7 2]; [13 18]

Thresholds	Deficit	Emerging	Established
Beginning	14 or less	15 to 29	30 or more
Middle	16 or less	17 to 34	35 or more
End	19 or less	20 to 39	40 or more

IN Standards: Standard 1 - Number Sense.

IN Indicators: Compare whole numbers up to 10 and arrange them in numerical order (1.1.5).

Upward Indicators: Second graders are expected to compare whole numbers up to 100 and arrange them in numerical order (2.1.5).

Rationale: Number sense involves basic “intuitions” and ideas about numbers, including concepts that make computation easier or eliminate the need for it altogether. It can refer to a child’s fluidity and flexibility with numbers, the sense of what numbers mean, and an ability to perform mental mathematics and to look at the world and make comparisons. Students with good number sense can move seamlessly between the real world of quantities and the mathematical world of numbers and numerical operations.

Number Facts

Items: Verbally presented addition problems with digits ≤ 10 and sums less than 20. Example: “How much is four plus two?”

Thresholds	Deficit	Emerging	Established
Beginning	1 or less	2 to 5	6 or more
Middle	4 or less	5 to 7	8 or more

End	6 or less	7 to 10	11 or more
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IN Standards: Standard 2 – Computation.

IN Indicators: Demonstrate mastery of the addition facts (for totals up to 20) and the corresponding subtraction facts (1.2.4).

Upward Indicators: Second graders are expected to add two whole numbers less than 100 with and without regrouping (2.2.2) and to use mental arithmetic to add or subtract 0, 1, 2, 3, 4, 5, or 10 with numbers less than 100 (2.2.6).

Rationale: Fluency in computation is essential to success in mathematics and fluency in basic addition facts is the foundation. At the beginning of the year, students may rely on addition strategies (for example, counting on their fingers) to come up with the answer; progress through quick calculation (5+5 is 10 so 5+6 must be 11); and eventually recall small sums from memory. Students who score low on this measure but seem to be executing a strategy would benefit from a Diagnostic Interview in the area of addition in order to unpack and explore their strategies.

Second Grade

Number Facts

Items: 60 items total. 30 addition items using randomly selected single-digit numbers; the position of the larger number alternates. 30 subtraction items with an equal number of double-digit (no larger than 18) by single-digit (for example, 13-5) and single-digit by single-digit (for example, 9-5) items.

Thresholds	Deficit	Emerging	Established
Beginning	10 or less	11 to 22	23 or more
Middle	10 or less	11 to 27	28 or more
End	18 or less	19 to 33	34 or more

IN Standards: Standard 2 – Computation.

IN Indicators: Add two whole numbers less than 100, with and without regrouping (2.2.2), and use mental arithmetic to add or subtract 0, 1, 2, 3, 4, 5, or 10 with numbers less than 100 (2.2.6).

Upward Indicators: Third graders are expected to add and subtract whole numbers up to 1,000 with or without regrouping, using relevant properties of the number system (3.3.1), and to show mastery of multiplication facts for 2, 5, and 10 (3.2.5).

Rationale: Fluency in computation is essential and fluency in basic addition and subtraction facts are the foundation. Students who score low on this measure, but seem to be executing a strategy, would benefit from a Diagnostic Interview in addition and/or subtraction to unpack and explore their strategies.

Missing Number

Items: 50 items total. Each item is three numbers and a blank, presented in a forward counting sequence, with the location of the blank varying. Student writes the missing number in the sequence. The position of the blank is rotated throughout the items.

Examples: [__, 75, 77, 79]; [8, 18, 28, __]

- 10 items: Non-sequential decade items with odd and even numbers between 0 and 99
- 4 items: Sequential by decade item containing 0 [for example, 0 (10) 20; (0) 10 20; 0 10 (20)]
- 8 items: Skip counting by 2 items containing odd and even numbers between 30 and 99
- 8 items: Skip counting by 3 items containing odd and even double- and single-digit items between 0 and 99
- 8 items: Skip counting by 4 items containing odd and even double- and single-digits between 20 and 99
- 5 items: Skip counting by 5 items containing numbers between 50 and 99 (for example, 70 (75) 80)
- 7 items: Skip counting by 6 items containing odd and even double- and single-digits between 0 and 30

Thresholds	Deficit	Emerging	Established
Beginning	2 or less	3 to 6	7 or more
Middle	2 or less	3 to 8	9 or more

End	3 or less	4 to 8	9 or more
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IN Standards: Standard 1 - Number Sense; Standard 3 - Algebra and Functions.

IN Indicators: Count by ones, twos, fives, and tens to 100 (2.1.1); identify the pattern of numbers in each group of ten, from tens through nineties (2.1.2); name the number that is ten more or ten less than any number 10 through 90 (2.1.4); create, describe, and extend number patterns using addition and subtraction (2.3.4).

Upward Indicators: Third graders are expected to create, describe, and extend number patterns using multiplication (3.3.5).

Rationale: Missing Number taps into mathematical “street smarts” or number sense. Students may use a variety of strategies to fill in the missing number, including counting up, counting backwards, or quickly recognizing the pattern. Students who are less fluent on this measure may be struggling to see the pattern (for example, skip count by 2s, 3s, 10s), or may make errors in calculating an answer. This task requires that the students recognize the number symbols and their sequence. In later years, this quick — or skip — counting will prove useful in doing repeated addition and subtraction.

Quantity Discrimination

Items: Whole numbers and operations are presented in pairs, and the student circles which number or quantity is larger. The order of placing the larger quantity first or second between sets is alternated.

- 12 whole number comparisons (for example, 61 45)
- 14 items comparing whole numbers to addition operations using whole numbers [for example, (72 66+5)]
- 10 items comparing addition operations (for example, 83+4 (83+6))
- 14 items comparing whole numbers to subtraction operations using whole numbers [for example, 78-9 (70)]
- 10 items comparing subtraction operations (for example, 30-2 30-9)

Thresholds	Deficit	Emerging	Established
Beginning	3 or less	4 to 13	14 or more
Middle	4 or less	5 to 15	16 or more
End	7 or less	8 to 17	18 or more

IN Standards: Standard 1 - Number Sense; Standard 2 – Computation.

IN Indicators: Compare whole numbers up to 100 and arrange them in numerical order (2.1.5); and use mental arithmetic to add or subtract 0, 1, 2, 3, 4, 5, or 10 with numbers less than 100. (2.2.6)

Upward Indicators: Third graders are expected to compare whole numbers up to 1,000 and arrange them in numerical order (3.1.5).

Rationale: Number sense involves basic “intuitions” and ideas about numbers, including concepts that make computation easier or eliminate the need for it altogether. It can refer to a child’s fluidity and flexibility with numbers, the sense of what numbers mean, and an ability to perform mental mathematics

and to look at the world and make comparisons. Students with good number sense can move seamlessly between the real world of quantities and the mathematical world of numbers and numerical operations.

Computation

Items: 24 items: 12 additions and 12 subtractions. Scoring is the correct number of *digits* in the responses.

Addition:

- 2 by 1, with regrouping (4 items)
- 2 by 1, without regrouping (2 items)
- 2 by 2, without regrouping (2 items)
- 2 by 2, with regrouping (2 items)
- 3 single digits, without regrouping (2 items)
- 3 double digits without regrouping (2 items)

Subtraction:

- 2 by 1, without regrouping (3 items)
- 2 by 1, with regrouping (3 items)
- 2 by 2, without regrouping (4 items)
- 2 by 2, with regrouping (2 items)

Thresholds	Deficit	Emerging	Established
Beginning	2 or less	3 to 8	9 or more
Middle	4 or less	5 to 15	16 or more
End	9 or less	10 to 23	24 or more

IN Standards: Standard 2 – Computation.

IN Indicators: Add two whole numbers less than 100 with and without regrouping (2.2.2); and subtract two whole numbers less than 100 without regrouping (2.2.3).

Upward Indicators: Third graders are expected to add and subtract whole numbers up to 1,000 with or without regrouping, using relevant properties of the number system (3.2.1).

Rationale: Fluency in computation is essential to mathematical success. The items in this measure present a mixture of computation problems to assess students' overall computational fluency. Students who score low on this measure would benefit from a Diagnostic Interview in addition or subtraction to unpack and explore their strategies. Some students may have particular misconceptions in the way they attempt to execute the algorithms for addition and subtraction (for example, adding all the digits together in addition, always subtracting the smaller number from the larger). The Written Diagnostic Interview is designed to elicit and uncover these misconceptions by interviewing students about how they arrived at their solutions.

The student's score is the number of correct digits in the responses, not just the number of correct responses. This scoring makes the measure more sensitive to small improvements in student's competency, such as correctly completing part of the algorithm.

Concepts

Items: A variety of items assessing the student's understanding of fundamental number concepts, including principles, place value, fractions, and symbolic notations.

Principles (8 items)

- Commutative principle of addition (for example, $__ + 6 = 6 + 4$) – 4 items- 2 items in one box; 2 single-digit and 2 double- by single-digit items (4 items)
- Inverse principle (for example, $59-23=36$; $36+__=59$) with double-digit numbers – 2 items in one box (4 items)

Place value (4 items)

- Identify the place value of a number in the thousands, hundreds, tens, or ones position - 4 items (for example, what place value does the 6 hold in the number 6891 and what value does the 8 hold in the same number?) (4 items)

Fractions (16 items)

- Match the fraction to its model (for example, match $\frac{1}{3}$ to the model) (3 items)
- Match the fraction to its word form (for example, match $\frac{1}{3}$ to one-third) (3 items in one box)
- Select the fraction that represents the shaded model (4 items)
- Writing fractions. Show a model with a portion shaded and ask the student to write the fraction (for example, $\frac{1}{3}$) (6 items)

Notations (2 items)

- Write $<$, $>$, or $=$ in each blank: 316 $______$ 968; 98 $______$ 225 (2 items in one box)

Thresholds	Deficit	Emerging	Established
Beginning	4 or less	5 to 8	9 or more
Middle	5 or less	6 to 10	11 or more
End	9 or less	10 to 14	15 or more

IN Standards: Standard 1 - Number Sense; Standard 2 - Computation; Standard 3 - Algebra and Functions.

IN Indicators: Recognize fractions as parts of a whole or parts of a group (up to 12 parts) (2.1.8); recognize, name, and compare the unit fractions (2.1.9); understand and use the inverse relationship between addition and subtraction (2.2.4); use the commutative and associative properties for addition to simplify mental calculations and to check results (2.3.2).

Upward Indicators: Third graders are expected to identify and interpret place value in whole numbers up to 1,000 (3.1.2); identify and use correct names for numerators and denominators (3.1.9); and given a decimal for tenths, show it as a fraction using a place-value model (3.1.12).

Rationale: Understanding number concepts is fundamental to the application and use of mathematical operations to solve problems.

Progress Monitoring and Diagnostic Interviews

- Start with the students who are Intensive (red) on the Screening. These students have low odds of being proficient on a standardized measure and merit additional instructional support.
- A Diagnostic Interview can reveal the underlying strengths and problem-solving methods on which you can build (for example, a student who is not fluent with number facts but who can reliably count using chips). This can be very beneficial in helping shape the instructional activities and plans for a specific student or group of students.
- Progress Monitoring every 2-4 weeks on a measure related to your instructional intervention efforts can reveal the degree of impact of those efforts.

Students who are Strategic on the Screening may be considered for Progress Monitoring and Diagnostic Interviews, but it may be worth waiting until Middle of Year Screening to confirm if they are making adequate progress through the normal course of instruction.

Below are suggestions for which Diagnostic Interview may be most useful to you at various stages of student's development.

K	Counting	Addition	Subtraction
BOY	Highly recommended	Highly recommended	Recommended
MOY	Highly recommended	Required	Highly recommended
EOY	Recommended	Highly recommended	Required

The most important skill within kindergarten is counting. By the middle of the year, children should know how to count well and have enumeration strategies in place before moving onto addition and subtraction. Although the counting interview is still recommended, by the end of the year children should be able to generalize their enumeration strategies to addition problems.

First Grade	Counting	Addition	Subtraction	Written
BOY	Required	Highly recommended	Recommended	Highly recommended
MOY	Highly recommended	Required	Highly recommended	Highly recommended
EOY	Recommended	Highly recommended	Required	Required

The most important skill at BOY for first graders is counting. Children need to know how to count well and have enumeration strategies in place before moving on to addition and subtraction. The counting interview is still highly recommended in the middle of the year. However, whether first graders can generalize enumeration strategies to addition problems becomes critical as these strategies will help children solve subtraction problems. By the end of the year, first graders need to have good addition and subtraction strategies in place. First graders should have acquired strong addition strategies by the EOY (End-of-Year) assessment, although they may still be working on subtraction skills. In addition, the written skills of first graders need to be assessed, as an understanding of base ten place value concepts will become increasingly important.

Second Grade	Addition	Subtraction	Multiplication	Written
BOY	Required	Required	Optional	Recommended
MOY	Highly recommended	Required	Optional	Highly recommended
EOY	Recommended	Highly recommended	Recommended	Required

It is imperative that teachers know whether second graders have good addition and subtraction strategies in place at the beginning of the year. Since subtraction is typically harder to master than addition, the Subtraction Interview continues to be important in the middle of the year. The Addition Interview and Written Interview are also highly recommended. At the end of the year, the Subtraction Interview is highly recommended, and the Written Interview is essential, as an understanding of base ten place value concepts is becoming increasingly important.